Patent Claims

1. Line terminating device for a subscriber line which transmits and receives broadband signals via a single subscriber line (4), a broadband signal being composed of a broadband or narrowband audio-frequency voice signal (ISDN, POTS) and a broadband higher-frequency data signal (US, DS; ADSL) and the frequency bands of the voice signal (ISDN, POTS) and of the data signal (US, DS; ADSL) essentially not overlapping,
characterized in that a digital frequency separating filter is provided which separates the audio-frequency voice signal (ISDN, POTS) and the higher-frequency data signal (US, DS; ADSL) from each other and which is arranged in the digital section of the line terminating device.

2. Line terminating device according to Claim 1, characterized in that
   - an analogue/digital converter (7; 206) is provided which converts a broadband received signal into a digital received signal,
   - a digital/analogue converter (8; 213) is provided which converts a digital transmit signal into a broadband transmit signal, and
   - the digital frequency separating filter (9; 207 - 212; 605) follows the analogue/digital converter (7; 206) and precedes the digital/analogue converter (8; 213) and separates the digital received signal into a first digital voice signal and a first digital data signal and combines a second digital voice signal and a second digital data signal to form the digital transmit signal.

3. Line terminating device according to one of the preceding claims,
characterized in that

- the digital frequency separating filter (9; 207 - 212; 605) has a first digital low-pass filter (10) and a first digital high-pass filter (11), the first digital low-pass filter (10) and the first digital high-pass filter (11) being supplied with the digital received signal (19) and that
- the digital frequency separating filter (9; 207 - 212; 605) has a second digital low-pass filter (17) and a second digital high-pass filter (16) and a digital adder (18), the second digital voice signal being supplied to the second digital low-pass filter (17) and the second digital data signal being supplied to the second digital high-pass filter (16) and the digital adder (18) adding the output signal of the second digital low-pass filter (17) and of the second digital high-pass filter (16) to form the digital transmit signal (20).

4. Line terminating device according to Claim 3, characterized in that the first digital low-pass filter (10) has a first series circuit of at least one first decimation filter (207) and the first digital high-pass filter (11) has a second series circuit of at least one second decimation filter (208).

5. Line terminating device according to Claim 3 or 4, characterized in that the second digital low-pass filter (17) has a third series circuit of at least one first interpolation filter (210) and the second digital high-pass filter (16) has a fourth series circuit of at least one second interpolation filter (209).

6. Line terminating device according to one of the preceding claims, characterized in that the digital frequency separating filter (9; 207 - 212;

605) has a noise shaper filter (212) which follows the digital adder (211).

7. Line terminating device according to one of the preceding claims, characterized in that an oversampling sigma/delta analogue/digital converter is provided as analogue/digital converter (10).

8. Signal processing facility according to one of the preceding claims, characterized in that the first digital low-pass filter (10), the first digital high-pass filter (11), the second digital low-pass filter (17) and the second digital high-pass filter (16) are designed as programs in a digital signal processor.

9. Signal processing device according to one of the preceding claims, characterized in that the analogue/digital converter (206) is preceded by an automatic gain control circuit (204) for controlling the amplitude of the received broadband analogue signal.

10. Signal processing device according to one of the preceding claims, characterized in that the digital/analogue converter (213) is followed by a power cutback circuit (215) for cutting back the power spectrum distribution.

11. Line terminating device according to one of the preceding claims, characterized in that the broadband audio-frequency voice signal is an ISDN voice signal and the broadband higher-frequency signal is an ADSL data signal.

12. Line terminating device according to one of Claims 1 to 10, characterized in that the broadband audio-frequency voice signal is a POTS

voice signal and the broadband higher-frequency data signal is an ADSL data signal.

13. Line terminating device according to one of the preceding claims, characterized in that the digital frequency separating filter (9; 207 - 212; 605) is designed with a number of channels, in which arrangement in each case audio-frequency POTS and/or ISDN voice signals and broadband higher-frequency ADSL data signals can be transmitted via the multiplicity of channels.

14. Line terminating device according to one of the preceding claims, characterized in that the digital frequency separating filter (9; 207 - 212; 605) has an echo canceller (EC) which is arranged both between an upstream signal path (622) and a downstream path (623).

15. Line terminating device according to Claim 14, characterized in that the echo canceller (EC) is provided for coarse correction and filters out an interference signal fed back by the digital frequency separating filter (9; 207 - 212; 605).

16. Line terminating device according to one of Claims 14 or 15, characterized in that the echo canceller (EC) in the digital frequency separating filter (9; 207 - 212; 605) can only be trained with a common operation of audio-frequency voice signal (ISDN, POTS) and higher-frequency data signal (US, DS; ADSL).

17. Line terminating device according to one Claims 14 to 16, characterized in that the interfaces (621, 630) to the transceiver circuits for the audio-frequency voice signal (ISDN, POTS) and higher-frequency data signal (US, DS; ADSL) and/or the transceiver circuits themselves have in each case

at least one further echo canceller which is used for fine correction of the interference signal set back in each case.

18. Line terminating device according to one of the preceding claims, characterized in that in the digital frequency separating filter (9; 207 - 212; 605) for separating the audio-frequency voice signal (ISDN, POTS) from the higher-frequency data signal (US, DS; ADSL), a low-pass filter circuit (628) is provided which contains a sampling rate decimator and a pulse shaper following the latter and which is connected via an interface (630) to a transceiver suitable for processing audio-frequency voice signals (ISDN, POTS).

19. Line terminating device according to one of the preceding claims, characterized in that, in the digital frequency separating filter (9; 207 - 212; 605), a further low-pass filter circuit (628) is provided which contains an upstream pulse shaper and a sampling rate integrator and which is connected via an interface (630) to a transceiver suitable for processing audio-frequency voice signals (ISDN, POTS), the low-pass filter circuit (628) providing at its output the audio-frequency voice signal (ISDN, POTS) which is superimposed on the higher-frequency data signal (US, DS; ADSL).

20. Line terminating device according to one of the preceding claims, characterized in that the digital frequency separating filter (9; 207 - 212; 605), together with a transformer (602), a line driver circuit (603), and a codec circuit (604), are integrated on a single chip.

21. Line terminating device according to one of the preceding claims, characterized in that the digital frequency separating filter (9; 207 - 212;

605) has at least one sampling rate adaptation stage and a clock synchronization unit which ensures that the sampling rates of the respective signal streams are of equal magnitude at the summation point (641) and at the splitting point (640).